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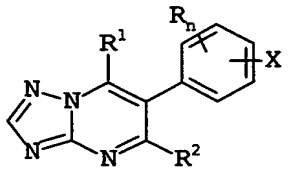
Fungicidal triazolopyrimidines, processes for their preparation and their use for controlling harmful fungi, and compositions comprising them

Description

The present invention relates to triazolopyrimidines of the formula I



I

where the index and the substituents are as defined below:

R^1 is C_1-C_{10}-alkyl, C_2-C_{10}-alkenyl, C_2-C_{10}-alkynyl, C_3-C_{10}-cycloalkyl, C_3-C_{10}-cycloalkenyl, phenyl, naphthyl or a five- to ten-membered saturated, partially unsaturated or aromatic heterocycle which is attached via carbon to the triazolopyrimidine and contains one to four heteroatoms from the group consisting of O, N and S,

where R^1 may be partially or fully halogenated or substituted by one to four identical or different groups R^a:

R^a is halogen, cyano, nitro, hydroxyl, C_1-C_6-alkyl, C_1-C_6-haloalkyl, C_1-C_6-alkylcarbonyl, C_3-C_6-cycloalkyl, C_1-C_6-alkoxy, C_1-C_6-haloalkoxy, C_1-C_6-alkoxycarbonyl, C_1-C_6-alkylthio, C_1-C_6-alkylamino, di-C_1-C_6-alkylamino, C_2-C_6-alkenyl, C_2-C_6-alkenyloxy, C_3-C_6-alkynyloxy, C_3-C_6-cycloalkyl, phenyl, naphthyl, a five- to ten-membered saturated, partially unsaturated or aromatic heterocycle which contains one to four heteroatoms from the group consisting of O, N and S,
where these aliphatic, alicyclic or aromatic groups for their part may be partially or fully halogenated or carry one to three groups R^b:

R^b is halogen, cyano, nitro, hydroxyl, mercapto, amino, carboxyl, aminocarbonyl, aminothiocarbonyl, alkyl, haloalkyl, alkenyl, alkynyl, alkenyloxy, alkynyloxy, alkoxy, haloalkoxy, alkylthio, alkylamino, dialkylamino, formyl, alkylcarbonyl, alkylsulfonyl, alkylsulfoxyl,

alkoxycarbonyl, alkylcarbonyloxy, alkylaminocarbonyl, dialkylaminocarbonyl, alkylaminothiocarbonyl, dialkylaminothiocarbonyl, where the alkyl groups in these radicals contain 1 to 6 carbon atoms and the abovementioned alkenyl or alkynyl groups in these radicals contain 2 to 8 carbon atoms and the abovementioned groups may be partially or fully halogenated;

and/or one to three of the following radicals:

cycloalkyl, cycloalkoxy, heterocyclyl, heterocyclyloxy, where the cyclic systems contain 3 to 10 ring members; aryl, aryloxy, arylthio, aryl—C_1—C_6—alkoxy, aryl—C_1—C_6—alkyl, hetaryl, hetaryloxy, hetarylthio, where the aryl radicals preferably contain 6 to 10 ring members and the hetaryl radicals 5 or 6 ring members, where the cyclic systems may be partially or fully halogenated or substituted by alkyl or haloalkyl groups;

R^2 is C_1-C_4-alkyl which may be substituted by halogen, cyano, nitro or C_1-C_2-alkoxy;

n is 0 or an integer from 1 to 4;

R is halogen, cyano, C_1-C_6-alkyl, C_2-C_{10}-alkenyl, C_2-C_{10}-alkynyl, C_1-C_6-haloalkyl, C_2-C_{10}-haloalkenyl, C_1-C_6-alkoxy, C_2-C_{10}-alkenyloxy, C_2-C_{10}-alkynyloxy, C_1-C_6-haloalkoxy, C_3-C_6-cycloalkyl, C_3-C_6-cycloalkenyl, C_3-C_6-cycloalkoxy, C_1-C_8-alkoxycarbonyl, C_2-C_{10}-alkenyloxycarbonyl, C_2-C_{10}-alkynyloxycarbonyl, aminocarbonyl, C_1-C_8-alkylaminocarbonyl, di-(C_1-C_8-)alkylaminocarbonyl, C_1-C_8-alkoximinoalkyl, C_2-C_{10}-alkenyloximinoalkyl, C_2-C_{10}-alkynyloximinoalkyl, C_1-C_8-alkylcarbonyl, C_2-C_{10}-alkenylcarbonyl, C_2-C_{10}-alkynylcarbonyl, C_3-C_6-cycloalkylcarbonyl, or a five- to ten-membered saturated, partially unsaturated or aromatic heterocycle which contains one to four heteroatoms from the group consisting of O, N and S;

X is SO_m-R^x, NR^xR^y or NR^x-(C=O)-R^y;

R^x, R^y are: hydrogen, C_1-C_6-alkyl, C_2-C_{10}-alkenyl, C_2-C_{10}-alkynyl, C_3-C_6-cycloalkyl, C_3-C_6-cycloalkenyl, where the above radicals may be partially or fully halogenated or substituted by cyano,

C_1-C_4-alkoximino, C_2-C_4-alkenyloximino, C_2-C_4-alkynyloximino or C_1-C_4-alkoxy;

m is 0 or an integer 1 to 3.

Moreover, the invention relates to a process for preparing these compounds, to compositions comprising them and to their use for controlling harmful fungi.

5-chlorotriazolopyrimidines for controlling harmful fungi are disclosed in EP-A 71 792, EP-A 550 113, WO-A 94/20501, EP-A 834 513, WO-A 98/46608 and WO-A 99/41255.

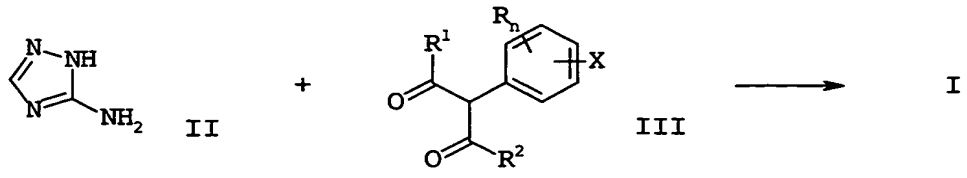
However, in many cases, their activity is unsatisfactory. It is an object of the invention to provide compounds having improved activity.

We have found that this object is achieved by the compounds defined at the outset. Furthermore, we have found processes for their preparation, compositions comprising them and methods for controlling harmful fungi using the compounds I.

The compounds of the formula I differ from the compounds in the abovementioned publications in that the 5-alkyl radical is combined with groups in position 7 which are attached via carbon.

Compared to the known compounds, the compounds of the formula I have increased activity against harmful fungi.

The compounds I can be obtained by different routes; advantageously, 5-aminotriazole of the formula II is used as starting material and condensed with dicarbonyl compounds of the formula III.



II + III → I

This reaction usually takes place at temperatures of from 80°C to 250°C, preferably from 120°C to 180°C, in the absence of a solvent or in an inert organic solvent in the presence of a base [cf. EP-A 770 615] or in the presence of acetic acid under the conditions known from Adv. Het. Chem. 57 (1993), 81 ff.

Suitable solvents are aliphatic hydrocarbons, aromatic hydrocarbons such as toluene, o-, m- and p-xylene, halogenated hydrocarbons, ethers, nitriles, ketones, alcohols, and also N-methyl pyrrolidone, dimethyl sulfoxide, dimethylformamide and dimethylacetamide. The reaction is particularly preferably carried out in the absence of a solvent or in ethylene glycol dimethyl ether, chlorobenzene, xylene, dimethyl sulfoxide or N-methylpyrrolidone. It is also possible to use mixtures of the solvents mentioned.

Suitable bases are, in general, inorganic compounds, such as alkali metal and alkaline earth metal hydroxides, alkali metal and alkaline earth metal oxides, alkali metal and alkaline earth metal hydrides, alkali metal amides, alkali metal and alkaline earth metal carbonates and also alkali metal bicarbonates, organometallic compounds, in particular alkali metal alkyls, alkylmagnesium halides and also alkali metal and alkaline earth metal alkoxides and dimethoxymagnesium, moreover organic bases, for example tertiary amines, such as trimethylamine, triethylamine, diisopropylethylamine, tributylamine and N-methylpiperidine, N-methylmorpholine, pyridine, substituted pyridines, such as collidine, lutidine and 4-dimethylaminopyridine, and also bicyclic amines. Particular preference is given to tertiary amines such as triisopropylamine, tributylamine, N-methylmorpholine or N-methylpiperidine.

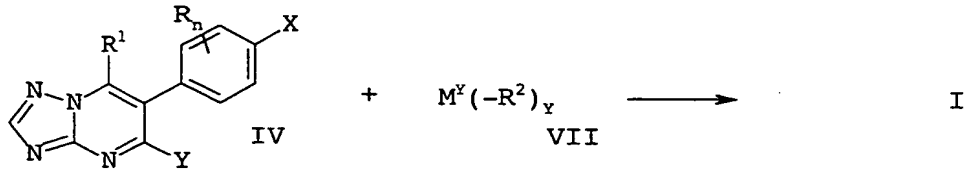
The bases are generally employed in catalytic amounts; however, they can also be employed in equimolar amounts, in excess or, if appropriate, as solvent.

The starting materials are generally reacted with one another in equimolar amounts. In terms of yield, it may be advantageous to employ an excess of base and diketone III, based on II.

The diketones III can be prepared analogously to processes known from the literature, for example as described in the publications mentioned above. Diketones having an acylamino substituent can be obtained, for example, by acylation from the corresponding amino group compound. In general, the amino grouping can be introduced into the phenyl ring by reducing a suitable nitro precursor. The sulfonic acid grouping can be introduced into the phenyl ring by direct sulfonylation of a suitable precursor using sulfuric acid or oleum. However, the sulfonic acid grouping can also be synthesized from a suitable diazonium salt by Sandmeyer reaction with sulfur trioxide. The diazonium salt can be obtained from the abovementioned amino compound. The sulfoxides and sulfones can be prepared by oxidizing the corresponding alkyl aryl sulfides by

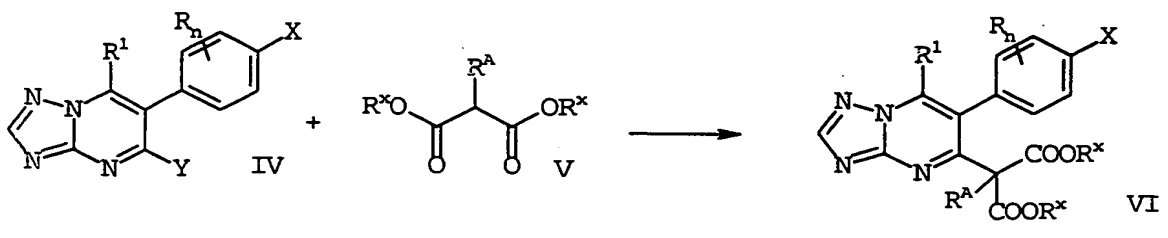
processes known from the literature using, for example, hydrogen peroxide, peracids or selenium dioxide.

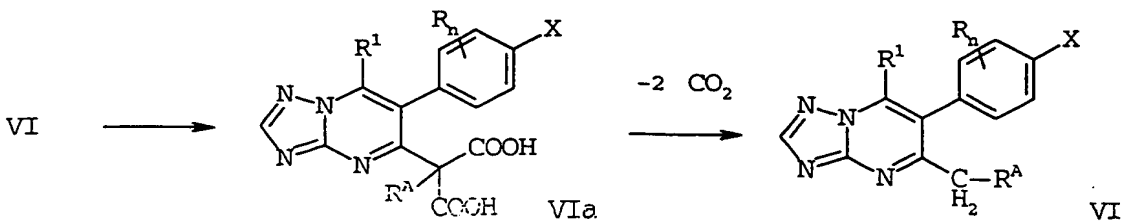
Compounds of the formula I can also be obtained by coupling 5-halotriazolopyrimidines of the formula IV (Y is halogen, in particular chlorine or bromine) with organometallic reagents of the formula VII.



In the formula VII, M is a metal ion having the valency Y, such as, for example, B, Zn, Mg or Sn. In one embodiment of this process, the reaction is carried out with transition metal catalysis, such as Ni or Pd catalysis. This reaction can be carried out, for example, analogously to the following methods: J. Chem. Soc. Perkin Trans. 1 (1994), 1187, ibid (1996), 2345; WO-A 99/41255; Aust. J. Chem. 43 (1990), 733; J. Org. Chem. 43 (1978), 358; J. Chem. Soc. Chem. Commun. (1979), 866; Tetrahedron Lett. 34 (1993), 8267; ibid 33 (1992), 413. In particular in cases where M is Zn or Mg, the reaction can also be carried out in the absence of a catalyst. The compounds IV are known from the publications cited at the outset. They are obtained, in particular, from 5,7-dichlorotriazolopyrimidines by introducing the radical R^1 using organometallic processes similar to those described above.

The compounds of the formula I' according to the invention can also be obtained by reacting 5-halotriazolopyrimidines of the formula IV with substituted malonic acid esters of the formula V, where R^X is C_1-C_4-alkyl, allyl, phenyl or benzyl, followed by hydrolysis of the resulting ester VI and decarboxylation of the carboxylic acid VIa.





In the formula IV, Y is halogen, in particular chlorine or bromine. The compounds IV are known from the publications cited at the outset. In the formula I', n, R and R^1 have the definitions given for the formula I and R^A is hydrogen or C_1-C_3-alkyl which may be substituted by halogen, cyano, nitro or C_1-C_2-alkoxy.

In a preferred embodiment of the process according to the invention, R^A is hydrogen or methyl, in particular hydrogen.

The starting materials V are known from the literature [J. Am. Chem. Soc. 64 (1942), 2714; J. Org. Chem. 39 (1974), 2172; Helv. Chim. Acta 61 (1978), 1565], or they can be prepared according to the literature cited.

The subsequent hydrolysis of the ester is carried out under generally known conditions [cf.: Greene & Wuts, Protective Groups in Organic Synthesis, Wiley (1991), p. 224 ff.: Cleavage of alkyl esters under Pd catalysis (p. 248); hydrolysis of benzyl esters (p. 251); Cleavage of methyl or ethyl esters in the presence of lithium salts such as LiI (p. 232), LiBr or LiCl; or under acidic or alkaline conditions]. Depending on the structural elements R^A, R_n and R^1, alkaline or acidic hydrolysis of the compounds VI may be advantageous. It is possible that full or partial decarboxylation to I' takes place even under the conditions of ester hydrolysis.

The decarboxylation is usually carried out at temperatures of from 20°C to 180°C, preferably from 50°C to 120°C, in an inert solvent, if appropriate in the presence of an acid.

Suitable acids are hydrochloric acid, sulfuric acid, phosphoric acid, formic acid, acetic acid, p-toluenesulfonic acid. Suitable solvents are water, aliphatic hydrocarbons, such as pentane, hexane, cyclohexane and petroleum ether, aromatic hydrocarbons, such as toluene, o-, m- and p-xylene, halogenated hydrocarbons, such as methylene chloride, chloroform and chlorobenzene, ethers, such as diethyl ether, diisopropyl ether, tert-butyl methyl ether, dioxane, anisole and tetrahydrofuran, nitriles, such as acetonitrile and propionitrile, ketones, such as acetone, methyl ethyl ketone, diethyl ketone and tert-butyl methyl ketone, alcohols, such as methanol, ethanol, n-propanol, isopropanol, n-butanol and tert-butanol, and also dimethyl sulfoxide, dimethylformamide and dimethylacetamide; the reaction is

particularly preferably carried out in hydrochloric acid or acetic acid. It is also possible to use mixtures of the solvents mentioned.

The reaction mixtures are worked up in a customary manner, for example by mixing with water, phase separation and, if required, chromatographic purification of the crude products. Some of the intermediates and end products are obtained in the form of colorless or slightly brownish, viscous oils, which are purified or freed from volatile components under reduced pressure and at moderately elevated temperatures. If the intermediates and end products are obtained as solids, purification can also be carried out by recrystallization or digestion.

If individual compounds I cannot be obtained by the routes described above, they can be prepared by derivatization of other compounds I.

If the synthesis yields isomer mixtures, a separation is generally not necessarily required since in some cases the individual isomers can be converted into one another during the preparation for use or upon use (for example under the action of light, acids or bases). Similar conversions may also occur after use, for example in the treatment of plants in the treated plant or in the harmful fungus or animal pest to be controlled.

In the definitions of the symbols given in the above formulae, collective terms were used which generally represent the following substituents:

halogen: fluorine, chlorine, bromine and iodine;

alkyl: saturated, straight-chain or branched hydrocarbon radicals having 1 to 4, 6, 8 or 10 carbon atoms, for example C_1-C_6-alkyl such as methyl, ethyl, propyl, 1-methylethyl, butyl, 1-methylpropyl, 2-methylpropyl, 1,1-dimethylethyl, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 2,2-dimethylpropyl, 1-ethylpropyl, hexyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 1-methylpentyl, 2-methylpentyl, 3-methylpentyl, 4-methylpentyl, 1,1-dimethylbutyl, 1,2-dimethylbutyl, 1,3-dimethylbutyl, 2,2-dimethylbutyl, 2,3-dimethylbutyl, 3,3-dimethylbutyl, 1-ethylbutyl, 2-ethylbutyl, 1,1,2-trimethylpropyl, 1,2,2-trimethylpropyl, 1-ethyl-1-methylpropyl and 1-ethyl-2-methylpropyl;

haloalkyl: straight-chain or branched alkyl groups having 1 to 10 carbon atoms (as mentioned above), where all or some of the hydrogen atoms in these groups may be replaced by halogen atoms as mentioned above, for example C_1-C_2-haloalkyl such as chloromethyl, bromomethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 1-chloroethyl, 1-bromoethyl, 1-fluoroethyl, 2-fluoroethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, 2-chloro-2-fluoroethyl, 2-chloro-2,2-difluoroethyl, 2,2-dichloro-2-fluoroethyl, 2,2,2-trichloroethyl and pentafluoroethyl;

alkenyl: unsaturated, straight-chain or branched hydrocarbon radicals having 2 to 4, 6, 8 or 10 carbon atoms and a double bond in any position, for example C_2-C_6-alkenyl such as ethenyl, 1-propenyl, 2-propenyl, 1-methylethenyl, 1-butenyl, 2-butenyl, 3-butenyl, 1-methyl-1-propenyl, 2-methyl-1-propenyl, 1-methyl-2-propenyl, 2-methyl-2-propenyl, 1-pentenyl, 2-pentenyl, 3-pentenyl, 4-pentenyl, 1-methyl-1-butenyl, 2-methyl-1-butenyl, 3-methyl-1-butenyl, 1-methyl-2-butenyl, 2-methyl-2-butenyl, 3-methyl-2-butenyl, 1-methyl-3-butenyl, 2-methyl-3-butenyl, 3-methyl-3-butenyl, 1,1-dimethyl-2-propenyl, 1,2-dimethyl-1-propenyl, 1,2-dimethyl-2-propenyl, 1-ethyl-1-propenyl, 1-ethyl-2-propenyl, 1-hexenyl, 2-hexenyl, 3-hexenyl, 4-hexenyl, 5-hexenyl, 1-methyl-1-pentenyl, 2-methyl-1-pentenyl, 3-methyl-1-pentenyl, 4-methyl-1-pentenyl, 1-methyl-2-pentenyl, 2-methyl-2-pentenyl, 3-methyl-2-pentenyl, 4-methyl-2-pentenyl, 1-methyl-3-pentenyl, 2-methyl-3-pentenyl, 3-methyl-3-pentenyl, 4-methyl-3-pentenyl, 1-methyl-4-pentenyl, 2-methyl-4-pentenyl, 3-methyl-4-pentenyl, 4-methyl-4-pentenyl, 1,1-dimethyl-2-butenyl, 1,1-dimethyl-3-butenyl, 1,2-dimethyl-1-butenyl, 1,2-dimethyl-2-butenyl, 1,2-dimethyl-3-butenyl, 1,3-dimethyl-1-butenyl, 1,3-dimethyl-2-butenyl, 1,3-dimethyl-3-butenyl, 2,2-dimethyl-3-butenyl, 2,3-dimethyl-1-butenyl, 2,3-dimethyl-2-butenyl, 2,3-dimethyl-3-butenyl, 3,3-dimethyl-1-butenyl, 3,3-dimethyl-2-butenyl, 1-ethyl-1-butenyl, 1-ethyl-2-butenyl, 1-ethyl-3-butenyl, 2-ethyl-1-butenyl, 2-ethyl-2-butenyl, 2-ethyl-3-butenyl, 1,1,2-trimethyl-2-propenyl, 1-ethyl-1-methyl-2-propenyl, 1-ethyl-2-methyl-1-propenyl and 1-ethyl-2-methyl-2-propenyl;

haloalkenyl: unsaturated, straight-chain or branched hydrocarbon radicals having 2 to 10 carbon atoms and a double bond in any position (as mentioned above), where all or some of the hydrogen

atoms in these groups may be replaced by halogen atoms as mentioned above, in particular by fluorine, chlorine and bromine;

alkynyl: straight-chain or branched hydrocarbon groups having 2 to 4, 6, 8 or 10 carbon atoms and a triple bond in any position, for example C_2-C_6-alkynyl such as ethynyl, 1-propynyl, 2-propynyl, 1-butynyl, 2-butynyl, 3-butynyl, 1-methyl-2-propynyl, 1-pentynyl, 2-pentynyl, 3-pentynyl, 4-pentynyl, 1-methyl-2-butynyl, 1-methyl-3-butynyl, 2-methyl-3-butynyl, 3-methyl-1-butynyl, 1,1-dimethyl-2-propynyl, 1-ethyl-2-propynyl, 1-hexynyl, 2-hexynyl, 3-hexynyl, 4-hexynyl, 5-hexynyl, 1-methyl-2-pentynyl, 1-methyl-3-pentynyl, 1-methyl-4-pentynyl, 2-methyl-3-pentynyl, 2-methyl-4-pentynyl, 3-methyl-1-pentynyl, 3-methyl-4-pentynyl, 4-methyl-1-pentynyl, 4-methyl-2-pentynyl, 1,1-dimethyl-2-butynyl, 1,1-dimethyl-3-butynyl, 1,2-dimethyl-3-butynyl, 2,2-dimethyl-3-butynyl, 3,3-dimethyl-1-butynyl, 1-ethyl-2-butynyl, 1-ethyl-3-butynyl, 2-ethyl-3-butynyl and 1-ethyl-1-methyl-2-propynyl;

cycloalkyl: mono- or bicyclic, saturated hydrocarbon groups having 3 to 6, 8, 10 or 12 carbon ring members, for example C_3-C_8-cycloalkyl such as cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl and cyclooctyl, or C_7-C_{12}-bicycloalkyl;

aryl: a mono- to trinuclear aromatic ring system comprising 6 to 14 carbon ring members, for example phenyl, naphthyl and anthracenyl;

five- to ten-membered saturated, partially unsaturated or aromatic heterocycle which is bonded to triazolopyrimidine via carbon and contains one to four heteroatoms from the group consisting of O, N and S:

- **5- or 6-membered heterocyclyl** which contains one to three nitrogen atoms and/or one oxygen or sulfur atom or one or two oxygen and/or sulfur atoms, for example 2-tetrahydrofuranyl, 3-tetrahydrofuranyl, 2-tetrahydrothienyl, 3-tetrahydrothienyl, 2-pyrrolidinyl, 3-pyrrolidinyl, 3-isoxazolidinyl, 4-isoxazolidinyl, 5-isoxazolidinyl, 3-isothiazolidinyl, 4-isothiazolidinyl, 5-isothiazolidinyl, 3-pyrazolidinyl, 4-pyrazolidinyl, 5-pyrazolidinyl, 2-oxazolidinyl, 4-oxazolidinyl, 5-oxazolidinyl, 2-thiazolidinyl, 4-thiazolidinyl, 5-thiazolidinyl, 2-imidazolidinyl, 4-imidazolidinyl, 1,2,4-oxadiazolidin-3-yl, 1,2,4-oxadiazolidin-5-yl, 1,2,4-thiadiazolidin-3-yl, 1,2,4-thiadiazolidin-5-yl, 1,2,4-triazolidin-3-yl, 1,3,4-oxadiazolidin-2-yl, 1,3,4-thiadiazolidin-2-yl, 1,3,4-triazolidin-2-yl, 2,3-dihydrofur-2-yl,

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- **5-membered heteroaryl** which contains one to four nitrogen atoms or one to three nitrogen atoms and one sulfur or oxygen atom: 5-membered heteroaryl groups which, in addition to carbon atoms, may contain one to four nitrogen atoms or one to three nitrogen atoms and one sulfur or oxygen atom as ring members, for example 2-furyl, 3-furyl, 2-thienyl, 3-thienyl, 2-pyrrolyl, 3-pyrrolyl, 3-isoxazolyl, 4-isoxazolyl, 5-isoxazolyl, 3-isothiazolyl, 4-isothiazolyl, 5-isothiazolyl, 3-pyrazolyl, 4-pyrazolyl, 5-pyrazolyl, 2-oxazolyl, 4-oxazolyl, 5-oxazolyl, 2-thiazolyl, 4-thiazolyl, 5-thiazolyl, 2-imidazolyl, 4-imidazolyl, 1,2,4-oxadiazol-3-yl, 1,2,4-oxadiazol-5-yl, 1,2,4-thiadiazol-3-yl, 1,2,4-thiadiazol-5-yl, 1,2,4-triazol-3-yl, 1,3,4-oxadiazol-2-yl, 1,3,4-thiadiazol-2-yl and 1,3,4-triazol-2-yl;
- **benzo-fused 5-membered heteroaryl** which contains one to three nitrogen atoms or one nitrogen atom and one oxygen or sulfur atom: 5-membered heteroaryl groups which, in addition to carbon atoms, may contain one to four nitrogen atoms or one to three nitrogen atoms and one sulfur or oxygen atom as ring members

and in which two adjacent carbon ring members or a nitrogen and an adjacent carbon ring member may be bridged by a buta-1,3-diene-1,4-diyl group;

- **6-membered heteroaryl** which contains one to three or one to four nitrogen atoms: 6-membered heteroaryl groups which, in addition to carbon atoms, may contain one to three or one to four nitrogen atoms as ring members, for example 2-pyridinyl, 3-pyridinyl, 4-pyridinyl, 3-pyridazinyl, 4-pyridazinyl, 2-pyrimidinyl, 4-pyrimidinyl, 5-pyrimidinyl, 2-pyrazinyl, 1,3,5-triazin-2-yl and 1,2,4-triazin-3-yl.

The scope of the present invention includes the (R) and (S) isomers and the racemates of compounds of the formula I having chiral centers.

With a view to the intended use of the triazolopyrimidines of the formula I, the following meanings of the substituents are particularly preferred, in each case on their own or in combination:

Preference is given to compounds I in which R^1 is C_3-C_8-alkyl, C_3-C_8-alkenyl, C_3-C_8-alkynyl, C_3-C_6-cycloalkyl or C_5-C_6-cycloalkenyl.

Particular preference is given to compounds I in which R^1 is C_1-C_8-alkyl or C_1-C_6-haloalkyl.

Additionally, preference is given to compounds I in which R^1 is C_2-C_{10}-alkynyl and in particular C_2-C_{10}-alkenyl. Particular preference is given to branched C_2-C_{10}-alkenyl.

Preference is likewise given to compounds I in which R^1 is a 5- or 6-membered saturated or aromatic heterocycle which is attached via carbon.

Moreover, particular preference is given to compounds I in which R^1 is C_3-C_6-cycloalkyl or C_5-C_6-cycloalkyl which may be substituted by C_1-C_4-alkyl.

Particular preference is given to compounds I in which R^a is halogen, cyano, C_1-C_6-alkyl, C_2-C_6-alkenyl, C_2-C_6-alkynyl, C_1-C_6-alkoxy, C_1-C_6-alkoxycarbonyl, C_1-C_6-alkoximino, C_2-C_6-alkenyloximino, C_2-C_6-alkynyloximino, C_3-C_6-cycloalkyl or C_5-C_6-cycloalkenyl, where the aliphatic or alicyclic groups for their part may be partially or fully halogenated or may carry one to three groups R^b.

Particular preference is given to compounds I in which R^b is halogen, cyano, C_1-C_6-alkyl, C_2-C_6-alkenyl, C_2-C_6-alkynyl, C_1-C_6-alkylcarbonyl, C_1-C_6-haloalkylcarbonyl or C_1-C_6-alkoxy.

Particular preference is also given to compounds I in which R^2 is C_1-C_4-alkyl which may be substituted by halogen.

Particular preference is likewise given to compounds I in which R^2 is methyl.

In addition, preference is given to compounds I in which R^2 is halomethyl.

Particular preference is also given to compounds I in which a substituent R is located in the 2-position and n is an integer from 1 to 3, in particular 1 or 2.

Moreover, particular preference is given to compounds I in which n is 2 or 3 and a substituent R is located in the 2-position.

Preference is furthermore given to compounds I in which R is fluorine, chlorine, bromine, cyano, C_1-C_6-alkyl or C_1-C_6-alkoxy.

Particular preference is likewise given to compounds I in which R is fluorine, chlorine, methyl, trifluoromethyl or methoxy.

In addition, particular preference is given to compounds I in which R_n is 2-chloro, 2-fluoro, 2-methyl, 2-methoxy, 2-trifluoromethyl, 2-trifluoromethyl-6-chloro, 2-chloro-6-fluoro, 2,6-difluoro, 2-fluoro-6-methyl, 2,4-difluoro, 2-fluoro-4-chloro, 2-fluoro-3-methyl, 2-fluoro-4-methyl, 2-chloro-4-fluoro, 2,4-dichloro, 2-chloro-4-methyl, 2-chloro-3-methyl, 2,6-dichloro, 2-chloro-6-methyl, 2-methyl-4-fluoro, 2-methyl-4-chloro, 2,4-dimethyl, 2,3-dimethyl, 2-methyl-6-fluoro, 2-methyl-6-chloro or 2,6-dimethyl.

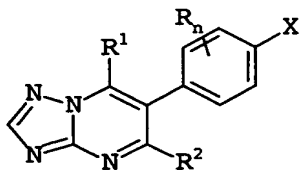
Moreover, particular preference is given to compounds I in which X is C_1-C_6-alkylsulfonyl, C_1-C_6-alkylsulfenyl, C_1-C_6-alkylsulfoxyl, C_1-C_6-alkylmercapto, amino, C_1-C_6-alkylamino, di-(C_1-C_6-alkyl)amino, C_1-C_6-alkylcarbonylamino, C_1-C_6-alkylcarbonyl(C_1-C_6-alkyl)amino.

Preference is given to compounds I in which the substituent X is located in the 3- or 5-position on the phenyl ring.

Especially preferred are compounds I in which the substituent X is located in the 4-position on the phenyl ring.

Particular preference is likewise given to compounds I in which m is 1 or 2. The sulfur atom is preferably attached directly to the phenyl ring. If m is 2 or 3, the sulfur may also be attached to the phenyl ring via oxygen.

Particular preference is given to triazolopyrimidines of the formula I'



I'

where the index and the substituents are as defined below:

R^1 is C_3-C_8-alkyl, C_3-C_8-alkenyl, C_3-C_8-alkynyl, C_3-C_6-cycloalkyl, C_5-C_6-cycloalkenyl; where R^1 may be partially or fully halogenated or substituted by one to four identical or different groups R^a:

R^a is halogen, cyano, C_1-C_6-alkyl, C_2-C_6-alkenyl, C_2-C_6-alkynyl, C_1-C_6-alkoxy, C_1-C_6-alkoxycarbonyl, C_1-C_6-alkoximino, C_2-C_6-alkenyloximino, C_2-C_6-alkynyloximino;

R^2 is C_1-C_4-alkyl which may be substituted by halogen;

n is an integer from 0 to 2;

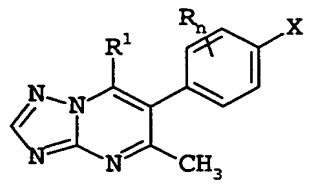
R is fluorine, chlorine, bromine, cyano, C_1-C_6-alkyl, C_1-C_6-alkoxy;

X is SO-R^x, SO_2-R^x or NR^x-$(C=O)$-R^y;

R^x, R^y are: hydrogen, C_1-C_6-alkyl, C_2-C_6-alkenyl or C_3-C_6-cycloalkyl, where the above radicals may be partially or fully halogenated.

With a view to their use, most particular preference is given to the compounds IA compiled in the tables below. Moroever, the groups mentioned in the tables for a substituent are themselves,

independently of the combination in which they are mentioned, a particularly preferred embodiment of the substituent in question.



IA

Table 1
Compounds of the formula IA in which R_n is 2-chloro, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 2
Compounds of the formula IA in which R_n is 2-fluoro, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 3
Compounds of the formula IA in which R_n is 2-methyl, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 4
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 5
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 6
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 7
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 8
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is acetylamino and R^1 for each compound corresponds to one row of

table A

Table 9
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 10
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 11
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 12
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is acetylamino and R^1 for each compound corresponds to one row of table A

Table 13
Compounds of the formula IA, in which R_n is 2-chloro, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 14
Compounds of the formula IA, in which R_n is 2-fluoro, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 15
Compounds of the formula IA, in which R_n is 2-methyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 16
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 17
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 18
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 19
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 20
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 21
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 22
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 23
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 24
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is N-acetyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 25
Compounds of the formula IA, in which R_n is 2-chloro, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 26
Compounds of the formula IA, in which R_n is 2-fluoro, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 27

Compounds of the formula IA, in which R_n is 2-methyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 28
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 29
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 30
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 31
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 32
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 33
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 34
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 35
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 36
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is N-acetyl-N-ethylamino and R^1 for each compound corresponds to

one row of table A

Table 37
Compounds of the formula IA, in which R_n is 2-chloro, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 38
Compounds of the formula IA, in which R_n is 2-fluoro, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 39
Compounds of the formula IA, in which R_n is 2-methyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 40
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 41
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 42
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 43
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 44
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 45
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 46
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 47
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 48
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is propionylamino and R^1 for each compound corresponds to one row of table A

Table 49
Compounds of the formula IA, in which R_n is 2-chloro, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 50
Compounds of the formula IA, in which R_n is 2-fluoro, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 51
Compounds of the formula IA, in which R_n is 2-methyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 52
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 53
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 54
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 55

Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 56
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 57
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 58
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 59
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 60
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is N-propionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 61
Compounds of the formula IA, in which R_n is 2-chloro, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 62
Compounds of the formula IA, in which R_n is 2-fluoro, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 63
Compounds of the formula IA, in which R_n is 2-methyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 64
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to

one row of table A

Table 65
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 66
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 67
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 68
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 69
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 70
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 71
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 72
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is N-propionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 73
Compounds of the formula IA, in which R_n is 2-chloro, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 74
Compounds of the formula IA, in which R_n is 2-fluoro, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 75
Compounds of the formula IA, in which R_n is 2-methyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 76
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 77
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 78
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 79
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 80
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 81
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 82
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 83

Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 84
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is 2-methylpropionylamino and R^1 for each compound corresponds to one row of table A

Table 85
Compounds of the formula IA, in which R_n is 2-chloro, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 86
Compounds of the formula IA, in which R_n is 2-fluoro, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 87
Compounds of the formula IA, in which R_n is 2-methyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 88
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 89
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 90
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 91
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 92
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound

corresponds to one row of table A

Table 93
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 94
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 95
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 96
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is N-2-methylpropionyl-N-methylamino and R^1 for each compound corresponds to one row of table A

Table 97
Compounds of the formula IA, in which R_n is 2-chloro, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 98
Compounds of the formula IA, in which R_n is 2-fluoro, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 99
Compounds of the formula IA, in which R_n is 2-methyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 100
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 101
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 102
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 103
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 104
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 105
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 106
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 107
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 108
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is N-2-methylpropionyl-N-ethylamino and R^1 for each compound corresponds to one row of table A

Table 109
Compounds of the formula IA, in which R_n is 2-chloro, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 110
Compounds of the formula IA, in which R_n is 2-fluoro, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 111

Compounds of the formula IA, in which R_n is 2-methyl, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 112
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 113
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 114
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 115
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 116
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 117
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 118
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 119
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is methylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 120
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is methylsulfonyl and R^1 for each compound corresponds to one row

of table A

Table 121
Compounds of the formula IA, in which R_n is 2-chloro, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 122
Compounds of the formula IA, in which R_n is 2-fluoro, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 123
Compounds of the formula IA, in which R_n is 2-methyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 124
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 125
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 126
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 127
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 128
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 129
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 130
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 131
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 132
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is ethylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 133
Compounds of the formula IA, in which R_n is 2-chloro, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 134
Compounds of the formula IA, in which R_n is 2-fluoro, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 135
Compounds of the formula IA, in which R_n is 2-methyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 136
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 137
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 138
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 139

Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 140
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 141
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 142
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 143
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 144
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is 2-methylpropylsulfonyl and R^1 for each compound corresponds to one row of table A

Table 145
Compounds of the formula IA, in which R_n is 2-chloro, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 146
Compounds of the formula IA, in which R_n is 2-fluoro, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 147
Compounds of the formula IA, in which R_n is 2-methyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 148
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is methylsulfoxyl and R^1 for each compound corresponds to one row of

table A

Table 149
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 150
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 151
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 152
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 153
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 154
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 155
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 156
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is methylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 157
Compounds of the formula IA, in which R_n is 2-chloro, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 158
Compounds of the formula IA, in which R_n is 2-fluoro, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 159
Compounds of the formula IA, in which R_n is 2-methyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 160
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 161
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 162
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 163
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 164
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 165
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 166
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 167

Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 168
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is ethylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 169
Compounds of the formula IA, in which R_n is 2-chloro, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 170
Compounds of the formula IA, in which R_n is 2-fluoro, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 171
Compounds of the formula IA, in which R_n is 2-methyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 172
Compounds of the formula IA, in which R_n is 2,6-dichloro, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 173
Compounds of the formula IA, in which R_n is 2,6-difluoro, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 174
Compounds of the formula IA, in which R_n is 2,6-dimethyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 175
Compounds of the formula IA, in which R_n is 2-chloro-3-methyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 176
Compounds of the formula IA, in which R_n is 2-fluoro-3-methyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to

one row of table A

Table 177
Compounds of the formula IA, in which R_n is 2,3-dimethyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 178
Compounds of the formula IA, in which R_n is 2-chloro-6-fluoro, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 179
Compounds of the formula IA, in which R_n is 2-chloro-6-methyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table 180
Compounds of the formula IA, in which R_n is 2-fluoro-6-methyl, X is 2-methylpropylsulfoxyl and R^1 for each compound corresponds to one row of table A

Table A

No.	R^1
A-1	CH_3
A-2	CH_2CH_3
A-3	$CH_2CH_2CH_3$
A-4	$CH(CH_3)_2$
A-5	$CH_2CH(CH_3)_2$
A-6	(±) $CH(CH_3)CH_2CH_3$
A-7	(R) $CH(CH_3)CH_2CH_3$
A-8	(S) $CH(CH_3)CH_2CH_3$
A-9	$(CH_2)_3CH_3$
A-10	$C(CH_3)_3$
A-11	$(CH_2)_4CH_3$
A-12	$CH(CH_2CH_3)_2$
A-13	$CH_2CH_2CH(CH_3)_2$
A-14	(±) $CH(CH_3)(CH_2)_2CH_3$
A-15	(R) $CH(CH_3)(CH_2)_2CH_3$
A-16	(S) $CH(CH_3)(CH_2)_2CH_3$
A-17	(±) $CH_2CH(CH_3)CH_2CH_3$
A-18	(R) $CH_2CH(CH_3)CH_2CH_3$
A-19	(S) $CH_2CH(CH_3)CH_2CH_3$

No.	R^1
A-20	(±) $CH(CH_3)CH(CH_3)_2$
A-21	(R) $CH(CH_3)CH(CH_3)_2$
A-22	(S) $CH(CH_3)CH(CH_3)_2$
A-23	$(CH_2)_5CH_3$
A-24	(±,±) $CH(CH_3)CH(CH_3)CH_2CH_3$
A-25	(±,R) $CH(CH_3)CH(CH_3)CH_2CH_3$
A-26	(±,S) $CH(CH_3)CH(CH_3)CH_2CH_3$
A-27	(±) $CH_2CH(CH_3)CF_3$
A-28	(R) $CH_2CH(CH_3)CF_3$
A-29	(S) $CH_2CH(CH_3)CF_3$
A-30	(±) $CH_2CH(CF_3)CH_2CH_3$
A-31	(R) $CH_2CH(CF_3)CH_2CH_3$
A-32	(S) $CH_2CH(CF_3)CH_2CH_3$
A-33	(±,±) $CH(CH_3)CH(CH_3)CF_3$
A-34	(±,R) $CH(CH_3)CH(CH_3)CF_3$
A-35	(±,S) $CH(CH_3)CH(CH_3)CF_3$
A-36	(±,±) $CH(CH_3)CH(CF_3)CH_2CH_3$
A-37	(±,R) $CH(CH_3)CH(CF_3)CH_2CH_3$
A-38	(±,S) $CH(CH_3)CH(CF_3)CH_2CH_3$
A-39	CF_3
A-40	CF_2CF_3
A-41	$CF_2CF_2CF_3$
A-42	$c\text{-}C_3H_5$
A-43	$(1\text{-}CH_3)\text{-}c\text{-}C_3H_4$
A-44	$c\text{-}C_5H_9$
A-45	$c\text{-}C_6H_{11}$
A-46	$(4\text{-}CH_3)\text{-}c\text{-}C_6H_{10}$
A-47	$CH_2C(CH_3)=CH_2$
A-48	$CH_2CH_2C(CH_3)=CH_2$
A-49	$CH_2\text{-}C(CH_3)_3$
A-50	$CH_2\text{-}Si(CH_3)_3$
A-51	$n\text{-}C_6H_{13}$
A-52	$(CH_2)_3\text{-}CH(CH_3)_2$
A-53	$(CH_2)_2\text{-}CH(CH_3)\text{-}C_2H_5$
A-54	$CH_2\text{-}CH(CH_3)\text{-}n\text{-}C_3H_7$
A-55	$CH(CH_3)\text{-}n\text{-}C_4H_9$
A-56	$CH_2\text{-}CH(C_2H_5)_2$
A-57	$CH(C_2H_5)\text{-}n\text{-}C_3H_7$

No.	R^1
A-58	CH_2-c-C_5H_9
A-59	CH_2-$CH(CH_3)$-$CH(CH_3)_2$
A-60	$CH(CH_3)$-$CH_2CH(CH_3)_2$
A-61	$CH(CH_3)$-$CH(CH_3)$-C_2H_5
A-62	$CH(CH_3)$-$C(CH_3)_3$
A-63	$(CH_2)_2$-$C(CH_3)_3$
A-64	CH_2-$C(CH_3)_2$-C_2H_5
A-65	2-CH_3-c-C_5H_8
A-66	3-CH_3-c-C_5H_8
A-67	$C(CH_3)_2$-n-C_3H_7
A-68	$(CH_2)_6$-CH_3
A-69	$(CH_2)_4$-$CH(CH_3)_2$
A-70	$(CH_2)_3$-$CH(CH_3)$-C_2H_5
A-71	$(CH_2)_2$-$CH(CH_3)$-n-C_3H_7
A-72	CH_2-$CH(CH_3)$-n-C_4H_9
A-73	$CH(CH_3)$-n-C_5H_{11}
A-74	$(CH_2)_3C(CH_3)_3$
A-75	$(CH_2)_2CH(CH_3)$-$CH(CH_3)_2$
A-76	$(CH_2)CH(CH_3)$-$CH_2CH(CH_3)_2$
A-77	$CH(CH_3)(CH_2)_2$-$CH(CH_3)_2$
A-78	$(CH_2)_2C(CH_3)_2C_2H_5$
A-79	$CH_2CH(CH_3)CH(CH_3)C_2H_5$
A-80	$CH(CH_3)CH_2CH(CH_3)C_2H_5$
A-81	$CH_2C(CH_3)_2$-n-C_3H_7
A-82	$CH(CH_3)CH(CH_3)$-n-C_3H_7
A-83	$C(CH_3)_2$-n-C_4H_9
A-84	$(CH_2)_2CH(C_2H_5)_2$
A-85	$CH_2CH(C_2H_5)$-n-C_3H_7
A-86	$CH(C_2H_5)$-n-C_4H_9
A-87	$CH_2CH(CH_3)C(CH_3)_3$
A-88	$CH(CH_3)CH_2C(CH_3)_3$
A-89	$CH_2C(CH_3)_2CH(CH_3)_2$
A-90	$CH_2CH(C_2H_5)CH(CH_3)_2$
A-91	$CH(CH_3)CH(CH_3)CH(CH_3)_2$
A-92	$C(CH_3)_2CH_2CH(CH_3)_2$
A-93	$CH(C_2H_5)CH_2CH(CH_3)_2$
A-94	$CH(CH_3)C(CH_3)_2C_2H_5$
A-95	$CH(CH_3)CH(C_2H_5)_2$

No.	R^1
A-96	$C(CH_3)_2CH(CH_3)C_2H_5$
A-97	$CH(C_2H_5)CH(CH_3)C_2H_5$
A-98	$C(CH_3)(C_2H_5)$-n-C_3H_7
A-99	$CH(n\text{-}C_3H_7)_2$
A-100	$CH(n\text{-}C_3H_7)CH(CH_3)_2$
A-101	$C(CH_3)_2C(CH_3)_3$
A-102	$C(CH_3)(C_2H_5)$-$CH(CH_3)_2$
A-103	$C(C_2H_5)_3$
A-104	$(3\text{-}CH_3)$-c-C_6H_{10}
A-105	$(2\text{-}CH_3)$-c-C_6H_{10}
A-106	n-C_8H_{17}
A-107	$CH_2C(=NO\text{-}CH_3)CH_3$
A-108	$CH_2C(=NO\text{-}C_2H_5)CH_3$
A-109	$CH_2C(=NO\text{-}n\text{-}C_3H_7)CH_3$
A-110	$CH_2C(=NO\text{-}i\text{-}C_3H_7)CH_3$
A-111	$CH(CH_3)C(=NOCH_3)CH_3$
A-112	$CH(CH_3)C(=NOC_2H_5)CH_3$
A-113	$CH(CH_3)C(=NO\text{-}n\text{-}C_3H_7)CH_3$
A-114	$CH(CH_3)C(=NO\text{-}i\text{-}C_3H_7)CH_3$
A-115	$C(=NOCH_3)C(=NOCH_3)CH_3$
A-116	$C(=NOCH_3)C(=NOC_2H_5)CH_3$
A-117	$C(=NOCH_3)C(=NO\text{-}n\text{-}C_3H_7)CH_3$
A-118	$C(=NOCH_3)C(=NO\text{-}i\text{-}C_3H_7)CH_3$
A-119	$C(=NOC_2H_5)C(=NOCH_3)CH_3$
A-120	$C(=NOC_2H_5)C(=NOC_2H_5)CH_3$
A-121	$C(=NOC_2H_5)C(=NO\text{-}n\text{-}C_3H_7)CH_3$
A-122	$C(=NOC_2H_5)C(=NO\text{-}i\text{-}C_3H_7)CH_3$
A-123	$CH_2C(=NO\text{-}CH_3)C_2H_5$
A-124	$CH_2C(=NO\text{-}C_2H_5)C_2H_5$
A-125	$CH_2C(=NO\text{-}n\text{-}C_3H_7)C_2H_5$
A-126	$CH_2C(=NO\text{-}i\text{-}C_3H_7)C_2H_5$
A-127	$CH(CH_3)C(=NOCH_3)C_2H_5$
A-128	$CH(CH_3)C(=NOC_2H_5)C_2H_5$
A-129	$CH(CH_3)C(=NO\text{-}n\text{-}C_3H_7)C_2H_5$
A-130	$CH(CH_3)C(=NO\text{-}n\text{-}C_3H_7)C_2H_5$
A-131	$C(=NOCH_3)C(=NOCH_3)C_2H_5$
A-132	$C(=NOCH_3)C(=NOC_2H_5)C_2H_5$
A-133	$C(=NOCH_3)C(=NO\text{-}n\text{-}C_3H_7)C_2H_5$

No.	R^1
A-134	$C(=NOCH_3)C(=NO\text{-}i\text{-}C_3H_7)C_2H_5$
A-135	$C(=NOC_2H_5)C(=NOCH_3)C_2H_5$
A-136	$C(=NOC_2H_5)C(=NOC_2H_5)C_2H_5$
A-137	$C(=NOC_2H_5)C(=NO\text{-}n\text{-}C_3H_7)C_2H_5$
A-138	$C(=NOC_2H_5)C(=NO\text{-}i\text{-}C_3H_7)C_2H_5$
A-139	$CH=CH-CH_2CH_3$
A-140	$CH_2-CH=CH-CH_3$
A-141	$CH_2-CH_2-CH=CH_2$
A-142	$C(CH_3)_2CH_2CH_3$
A-143	$CH=C(CH_3)_2$
A-144	$C(=CH_2)-CH_2CH_3$
A-145	$C(CH_3)=CH-CH_3$
A-146	$CH(CH_3)CH=CH_2$
A-147	$CH=CH\text{-}n\text{-}C_3H_7$
A-148	$CH_2-CH=CH-C_2H_5$
A-149	$(CH_2)_2-CH=CH-CH_3$
A-150	$(CH_2)_3-CH=CH_2$
A-151	$CH=CH-CH(CH_3)_2$
A-152	$CH_2-CH=C(CH_3)_2$
A-153	$(CH_2)_2-C(CH_3)=CH_2$
A-154	$CH=C(CH_3)-C_2H_5$
A-155	$CH_2-C(=CH_2)-C_2H_5$
A-156	$CH_2-C(CH_3)=CH-CH_3$
A-157	$CH_2-CH(CH_3)-CH=CH_2$
A-158	$C(=CH_2)-CH_2-CH_2-CH_3$
A-159	$C(CH_3)=CH-CH_2-CH_3$
A-160	$CH(CH_3)-CH=CH-CH_3$
A-161	$CH(CH_3)-CH_2-CH=CH_2$
A-162	$C(=CH_2)CH(CH_3)_2$
A-163	$C(CH_3)=C(CH_3)_2$
A-164	$CH(CH_3)-C(=CH_2)-CH_3$
A-165	$C(CH_3)_2-CH=CH_2$
A-166	$C(C_2H_5)=CH-CH_3$
A-167	$CH(C_2H_5)-CH=CH_2$
A-168	$CH=CH-CH_2-CH_2-CH_2-CH_3$
A-169	$CH_2-CH=CH-CH_2-CH_2-CH_3$
A-170	$CH_2-CH_2-CH=CH-CH_2-CH_3$
A-171	$CH_2-CH_2-CH_2-CH=CH-CH_3$

No.	R^1
A-172	$CH_2-CH_2-CH_2-CH_2-CH=CH_2$
A-173	$CH=CH-CH_2-CH(CH_3)CH_3$
A-174	$CH_2-CH=CH-CH(CH_3)CH_3$
A-175	$CH_2-CH_2-CH=C(CH_3)CH_3$
A-176	$CH_2-CH_2-CH_2-C(CH_3)=CH_2$
A-177	$CH=CH-CH(CH_3)-CH_2-CH_3$
A-178	$CH_2-CH=C(CH_3)-CH_2-CH_3$
A-179	$CH_2-CH_2-C(=CH_2)-CH_2-CH_3$
A-180	$CH_2-CH_2-C(CH_3)=CH-CH_3$
A-181	$CH_2-CH_2-CH(CH_3)-CH=CH_2$
A-182	$CH=C(CH_3)-CH_2-CH_2-CH_3$
A-183	$CH_2-C(=CH_2)-CH_2-CH_2-CH_3$
A-184	$CH_2-C(CH_3)=CH-CH_2-CH_3$
A-185	$CH_2-CH(CH_3)-CH=CH-CH_3$
A-186	$CH_2-CH(CH_3)-CH_2-CH=CH_2$
A-187	$C(=CH_2)-CH_2-CH_2-CH_2-CH_3$
A-188	$C(CH_3)=CH-CH_2-CH_2-CH_3$
A-189	$CH(CH_3)-CH=CH-CH_2-CH_3$
A-190	$CH(CH_3)-CH_2-CH=CH-CH_3$
A-191	$CH(CH_3)-CH_2-CH_2-CH=CH_2$
A-192	$CH=CH-C(CH_3)_3$
A-193	$CH=C(CH_3)-CH(CH_3)-CH_3$
A-194	$CH_2-C(=CH_2)-CH(CH_3)-CH_3$
A-195	$CH_2-C(CH_3)=C(CH_3)-CH_3$
A-196	$CH_2-CH(CH_3)-C(=CH_2)-CH_3$
A-197	$C(=CH_2)-CH_2-CH(CH_3)-CH_3$
A-198	$C(CH_3)=CH-CH(CH_3)-CH_3$
A-199	$CH(CH_3)-CH=C(CH_3)-CH_3$
A-200	$CH(CH_3)-CH_2-C(=CH_2)-CH_3$
A-201	$CH=C(CH_2-CH_3)-CH_2-CH_3$
A-202	$CH_2-C(=CH-CH_3)-CH_2-CH_3$
A-203	$CH_2-CH(CH=CH_2)-CH_2-CH_3$
A-204	$C(=CH-CH_3)-CH_2-CH_2-CH_3$
A-205	$CH(CH=CH_2)-CH_2-CH_2-CH_3$
A-206	$C(CH_2-CH_3)=CH-CH_2-CH_3$
A-207	$CH(CH_2-CH_3)-CH=CH-CH_3$
A-208	$CH(CH_2-CH_3)-CH_2-CH=CH_2$
A-209	$CH_2-C(CH_3)_2-CH=CH_2$

No.	R^1
A-210	$C(=CH_2)-CH(CH_3)-CH_2-CH_3$
A-211	$C(CH_3)=C(CH_3)-CH_2-CH_3$
A-212	$CH(CH_3)-C(=CH_2)-CH_2-CH_3$
A-213	$CH(CH_3)-C(CH_3)=CH-CH_3$
A-214	$CH(CH_3)-CH(CH_3)-CH=CH_2$
A-215	$C(CH_3)_2-CH=CH-CH_3$
A-216	$C(CH_3)_2-CH_2-CH=CH_2$
A-217	$C(=CH_2)-C(CH_3)_3$
A-218	$C(=CH-CH_3)-CH(CH_3)-CH_3$
A-219	$CH(CH=CH_2)-CH(CH_3)-CH_3$
A-220	$C(CH_2-CH_3)=C(CH_3)-CH_3$
A-221	$CH(CH_2-CH_3)-C(=CH_2)-CH_3$
A-222	$C(CH_3)_2-C(=CH_2)-CH_3$
A-223	$C(CH_3)(CH=CH_2)-CH_2-CH_3$
A-224	$C(CH_3)(CH_2CH_3)-CH_2-CH_2-CH_3$
A-225	$CH(CH_2CH_3)-CH(CH_3)-CH_2-CH_3$
A-226	$CH(CH_2CH_3)-CH_2-CH(CH_3)-CH_3$
A-227	$C(CH_3)_2-C(CH_3)_3$
A-228	$C(CH_2-CH_3)-C(CH_3)_3$
A-229	$C(CH_3)(CH_2-CH_3)-CH(CH_3)_2$
A-230	$CH(CH(CH_3)_2)-CH(CH_3)_2$
A-231	$CH=CH-CH_2-CH_2-CH_2-CH_2-CH_3$
A-232	$CH_2-CH=CH-CH_2-CH_2-CH_2-CH_3$
A-233	$CH_2-CH_2-CH=CH-CH_2-CH_2-CH_3$
A-234	$CH_2-CH_2-CH_2-CH=CH-CH_2-CH_3$
A-235	$CH_2-CH_2-CH_2-CH_2-CH=CH-CH_3$
A-236	$CH_2-CH_2-CH_2-CH_2-CH_2-CH=CH_2$
A-237	$CH=CH-CH_2-CH_2-CH(CH_3)-CH_3$
A-238	$CH_2-CH=CH-CH_2-CH(CH_3)-CH_3$
A-239	$CH_2-CH_2-CH=CH-CH(CH_3)-CH_3$
A-240	$CH_2-CH_2-CH_2-CH=C(CH_3)-CH_3$
A-241	$CH_2-CH_2-CH_2-CH_2-C(=CH_2)-CH_3$
A-242	$CH=CH-CH_2-CH(CH_3)-CH_2-CH_3$
A-243	$CH_2-CH=CH-CH(CH_3)-CH_2-CH_3$
A-244	$CH_2-CH_2-CH=C(CH_3)-CH_2-CH_3$
A-245	$CH_2-CH_2-CH_2-C(=CH_2)-CH_2-CH_3$
A-246	$CH_2-CH_2-CH_2-C(CH_3)=CH-CH_3$
A-247	$CH_2-CH_2-CH_2-CH(CH_3)-CH=CH_2$

No.	R^1
A-248	$CH=CH-CH(CH_3)-CH_2-CH_2-CH_3$
A-249	$CH_2-CH=C(CH_3)-CH_2-CH_2-CH_3$
A-250	$CH_2-CH_2-C(=CH_2)-CH_2-CH_2-CH_3$
A-251	$CH_2-CH_2-C(CH_3)=CH-CH_2-CH_3$
A-252	$CH_2-CH_2-CH(CH_3)-CH=CH-CH_3$
A-253	$CH_2-CH_2-CH(CH_3)-CH_2-CH=CH_2$
A-254	$CH=C(CH_3)-CH_2-CH_2-CH_2-CH_3$
A-255	$CH_2-C(=CH_2)-CH_2-CH_2-CH_2-CH_3$
A-256	$CH_2-C(CH_3)=CH-CH_2-CH_2-CH_3$
A-257	$CH_2-CH(CH_3)-CH=CH-CH_2-CH_3$
A-258	$CH_2-CH(CH_3)-CH_2-CH=CH-CH_3$
A-259	$CH_2-CH(CH_3)-CH_2-CH_2-CH=CH_2$
A-260	$C(=CH_2)-CH_2-CH_2-CH_2-CH_2-CH_3$
A-261	$C(CH_3)=CH-CH_2-CH_2-CH_2-CH_3$
A-262	$CH(CH_3)-CH=CH-CH_2-CH_2-CH_3$
A-263	$CH(CH_3)-CH_2-CH=CH-CH_2-CH_3$
A-264	$CH(CH_3)-CH_2-CH_2-CH=CH-CH_3$
A-265	$CH(CH_3)-CH_2-CH_2-CH_2-CH=CH_2$
A-266	$CH=CH-CH_2-C(CH_3)_3$
A-267	$CH_2-CH=CH-C(CH_3)_3$
A-268	$CH=CH-CH(CH_3)-CH(CH_3)_2$
A-269	$CH_2-CH=C(CH_3)-CH(CH_3)_2$
A-270	$CH_2-CH_2-C(=CH_2)-CH(CH_3)_2$
A-271	$CH_2-CH_2-C(CH_3)=C(CH_3)_2$
A-272	$CH_2-CH_2-CH(CH_3)-C(=CH_2)-CH_3$
A-273	$CH=C(CH_3)-CH_2-CH(CH_3)_2$
A-274	$CH_2-C(=CH_2)-CH_2-CH(CH_3)_2$
A-275	$CH_2-C(CH_3)=CH-CH(CH_3)_2$
A-276	$CH_2-CH(CH_3)-CH=C(CH_3)_2$
A-277	$CH_2-CH(CH_3)-CH_2-C(=CH_2)-CH_3$
A-278	$C(=CH_2)-CH_2-CH_2-CH(CH_3)_2$
A-279	$C(CH_3)=CH-CH_2-CH(CH_3)_2$
A-280	$CH(CH_3)-CH=CH-CH(CH_3)_2$
A-281	$CH(CH_3)-CH_2-CH=C(CH_3)_2$
A-282	$CH(CH_3)-CH_2-CH_2-C(=CH_2)-CH_3$
A-283	$CH=CH-C(CH_3)_2-CH_2-CH_3$
A-284	$CH_2-CH_2-C(CH_3)_2-CH=CH_2$
A-285	$CH=C(CH_3)-CH(CH_3)-CH_2-CH_3$

No.	R^1
A-286	$CH_2-C(=CH_2)-CH(CH_3)-CH_2-CH_3$
A-287	$CH_2-C(CH_3)=C(CH_3)-CH_2-CH_3$
A-288	$CH_2-CH(CH_3)-C(=CH_2)-CH_2-CH_3$
A-289	$CH_2-CH(CH_3)-C(CH_3)=CH-CH_3$
A-290	$CH_2-CH(CH_3)-CH(CH_3)-CH=CH_2$
A-291	$C(=CH_2)-CH_2-CH(CH_3)-CH_2-CH_3$
A-292	$C(CH_3)=CH-CH(CH_3)-CH_2-CH_3$
A-293	$CH(CH_3)-CH=C(CH_3)-CH_2-CH_3$
A-294	$CH(CH_3)-CH_2-C(=CH_2)-CH_2-CH_3$
A-295	$CH(CH_3)-CH_2-C(CH_3)=CH-CH_3$
A-296	$CH(CH_3)-CH_2-CH(CH_3)-CH=CH_2$
A-297	$CH_2-C(CH_3)_2-CH=CH-CH_3$
A-298	$CH_2-C(CH_3)_2-CH_2-CH=CH_2$
A-299	$C(=CH_2)-CH(CH_3)-CH_2-CH_2-CH_3$
A-300	$C(CH_3)=C(CH_3)-CH_2-CH_2-CH_3$
A-301	$CH(CH_3)-C(=CH_2)-CH_2-CH_2-CH_3$
A-302	$CH(CH_3)-C(CH_3)=CH-CH_2-CH_3$
A-303	$CH(CH_3)-CH(CH_3)-CH=CH-CH_3$
A-304	$CH(CH_3)-CH(CH_3)-CH_2-CH=CH_2$
A-305	$C(CH_3)_2-CH=CH-CH_2-CH_3$
A-306	$C(CH_3)_2-CH_2-CH=CH-CH_3$
A-307	$C(CH_3)_2-CH_2-CH_2-CH=CH_2$
A-308	$CH=CH-CH(CH_2-CH_3)-CH_2-CH_3$
A-309	$CH_2-CH=C(CH_2-CH_3)-CH_2-CH_3$
A-310	$CH_2-CH_2-C(=CH-CH_3)-CH_2-CH_3$
A-311	$CH_2-CH_2-CH(CH=CH_2)-CH_2-CH_3$
A-312	$CH=C(CH_2-CH_3)-CH_2-CH_2-CH_3$
A-313	$CH_2-C(=CH-CH_3)-CH_2-CH_2-CH_3$
A-314	$CH_2-CH(CH=CH_2)-CH_2-CH_2-CH_3$
A-315	$CH_2-C(CH_2-CH_3)=CH-CH_2-CH_3$
A-316	$CH_2-CH(CH_2-CH_3)-CH=CH-CH_3$
A-317	$CH_2-CH(CH_2-CH_3)-CH-CH=CH_2$
A-318	$C(=CH-CH_3)-CH_2-CH_2-CH_2-CH_3$
A-319	$CH(CH=CH_2)-CH_2-CH_2-CH_2-CH_3$
A-320	$C(CH_2-CH_3)=CH-CH_2-CH_2-CH_3$
A-321	$CH(CH_2-CH_3)-CH=CH-CH_2-CH_3$
A-322	$CH(CH_2-CH_3)-CH_2-CH=CH-CH_3$
A-323	$CH(CH_2-CH_3)-CH_2-CH_2-CH=CH_2$

No.	R^1
A-324	$C(=CH-CH_2-CH_3)-CH_2-CH_2-CH_3$
A-325	$C(CH=CH-CH_3)-CH_2-CH_2-CH_3$
A-326	$C(CH_2-CH=CH_2)-CH_2-CH_2-CH_3$
A-327	$CH=C(CH_3)-C(CH_3)_3$
A-328	$CH_2-C(=CH_2)-C(CH_3)_3$
A-329	$CH_2-C(CH_3)_2-CH(=CH_2)-CH_3$
A-330	$C(=CH_2)-CH(CH_3)-CH(CH_3)-CH_3$
A-331	$C(CH_3)=C(CH_3)-CH(CH_3)-CH_3$
A-332	$CH(CH_3)-C(=CH_2)-CH(CH_3)-CH_3$
A-333	$CH(CH_3)-C(CH_3)=C(CH_3)-CH_3$
A-334	$CH(CH_3)-CH(CH_3)-C(=CH_2)-CH_3$
A-335	$C(CH_3)_2-CH=C(CH_3)-CH_3$
A-336	$C(CH_3)_2-CH_2-C(=CH_2)-CH_3$
A-337	$C(CH_3)_2-C(=CH_2)-CH_2-CH_3$
A-338	$C(CH_3)_2-C(CH_3)=CH-CH_3$
A-339	$C(CH_3)_2-CH(CH_3)CH=CH_2$
A-340	$CH(CH_2-CH_3)-CH_2-CH(CH_3)-CH_3$
A-341	$CH(CH_2-CH_3)-CH(CH_3)-CH_2-CH_3$
A-342	$C(CH_3)(CH_2-CH_3)-CH_2-CH_2-CH_3$
A-343	$CH(i-C_3H_7)-CH_2-CH_2-CH_3$
A-344	$CH=C(CH_2-CH_3)-CH(CH_3)-CH_3$
A-345	$CH_2-C(=CH-CH_3)-CH(CH_3)-CH_3$
A-346	$CH_2-CH(CH=CH_2)-CH(CH_3)-CH_3$
A-347	$CH_2-C(CH_2-CH_3)=C(CH_3)-CH_3$
A-348	$CH_2-CH(CH_2-CH_3)-C(=CH_2)-CH_3$
A-349	$CH_2-C(CH_3)(CH=CH_2)-CH_2-CH_3$
A-350	$C(=CH_2)-CH(CH_2-CH_3)-CH_2-CH_3$
A-351	$C(CH_3)=C(CH_2-CH_3)-CH_2-CH_3$
A-352	$CH(CH_3)-C(=CH-CH_3)-CH_2-CH_3$
A-353	$CH(CH_3)-CH(CH=CH_2)-CH_2-CH_3$
A-354	$CH=C(CH_2-CH_3)-CH(CH_3)-CH_3$
A-355	$CH_2-C(=CH-CH_3)-CH(CH_3)-CH_3$
A-356	$CH_2-CH(CH=CH_2)-CH(CH_3)-CH_3$
A-357	$CH_2-C(CH_2-CH_3)=C(CH_3)-CH_3$
A-358	$CH_2-CH(CH_2-CH_3)-C(=CH_2)-CH_3$
A-359	$C(=CH-CH_3)-CH_2-CH(CH_3)-CH_3$
A-360	$CH(CH=CH_2)-CH_2-CH(CH_3)-CH_3$
A-361	$C(CH_2-CH_3)=CH-CH(CH_3)-CH_3$

No.	R^1
A-362	$CH(CH_2-CH_3)CH=C(CH_3)-CH_3$
A-363	$CH(CH_2-CH_3)CH_2-C(=CH_2)-CH_3$
A-364	$C(=CH-CH_3)CH(CH_3)-CH_2-CH_3$
A-365	$CH(CH=CH_2)CH(CH_3)-CH_2-CH_3$
A-366	$C(CH_2-CH_3)=C(CH_3)-CH_2-CH_3$
A-367	$CH(CH_2-CH_3)-C(=CH_2)-CH_2-CH_3$
A-368	$CH(CH_2-CH_3)-C(CH_3)=CH-CH_3$
A-369	$CH(CH_2-CH_3)-CH(CH_3)-CH=CH_2$
A-370	$C(CH_3)(CH=CH_2)-CH_2-CH_2-CH_3$
A-371	$C(CH_3)(CH_2-CH_3)-CH=CH-CH_3$
A-372	$C(CH_3)(CH_2-CH_3)-CH_2-CH=CH_2$
A-373	$C[=C(CH_3)-CH_3]-CH_2-CH_2-CH_3$
A-374	$CH[C(=CH_2)-CH_3]-CH_2-CH_2-CH_3$
A-375	$C(i\text{-}C_3H_7)=CH-CH_2-CH_3$
A-376	$CH(i\text{-}C_3H_7)-CH=CH-CH_3$
A-377	$CH(i\text{-}C_3H_7)-CH_2-CH=CH_2$
A-378	$C(=CH-CH_3)-C(CH_3)_3$
A-379	$CH(CH=CH_2)-C(CH_3)_3$
A-380	$C(CH_3)(CH=CH_2)CH(CH_3)-CH_3$
A-381	$C(CH_3)(CH_2-CH_3)C(=CH_2)-CH_3$
A-382	2-CH_3-cyclohex-1-enyl
A-383	[2-(=CH_2)]-c-C_6H_9
A-384	2-CH_3-cyclohex-2-enyl
A-385	2-CH_3-cyclohex-3-enyl
A-386	2-CH_3-cyclohex-4-enyl
A-387	2-CH_3-cyclohex-5-enyl
A-388	2-CH_3-cyclohex-6-enyl
A-389	3-CH_3-cyclohex-1-enyl
A-390	3-CH_3-cyclohex-2-enyl
A-391	[3-(=CH_2)]-c-C_6H_9
A-392	3-CH_3-cyclohex-3-enyl
A-393	3-CH_3-cyclohex-4-enyl
A-394	3-CH_3-cyclohex-5-enyl
A-395	3-CH_3-cyclohex-6-enyl
A-396	4-CH_3-cyclohex-1-enyl
A-397	4-CH_3-cyclohex-2-enyl
A-398	4-CH_3-cyclohex-3-enyl
A-399	[4-(=CH_2)]-c-C_6H_9

The compounds I are suitable as fungicides. They have excellent activity against a broad spectrum of phytopathogenic fungi, in particular from the class of the *Ascomycetes*, *Deuteromycetes*, *Oomycetes* and *Basidiomycetes*. Some of them act systemically and can be employed in crop protection as foliar- and soil-acting fungicides.

They are especially important for controlling a large number of fungi in a variety of crop plants such as wheat, rye, barley, oats, rice, maize, grass, bananas, cotton, soybean, coffee, sugar cane, grapevines, fruit species, ornamentals and vegetable species such as cucumbers, beans, tomatoes, potatoes and cucurbits, and also in the seeds of these plants.

Specifically, they are suitable for controlling the following plant diseases:

- Alternaria species in vegetables and fruit,
- Bipolaris and Drechslera species in cereals, rice and lawns,
- Blumeria graminis (powdery mildew) in cereals,
- Botrytis cinerea (gray mold) in strawberries, vegetables, ornamentals and grapevines,
- Erysiphe cichoracearum and Sphaerotheca fuliginea in cucurbits,
- Fusarium and Verticillium species in a variety of plants,
- Mycosphaerella species in cereals, bananas and groundnuts,
- Phytophthora infestans in potatoes and tomatoes,
- Plasmopara viticola in grapevines,
- Podosphaera leucotricha in apples,
- Pseudocercosporella herpotrichoides in wheat and barley,
- Pseudoperonospora species in hops and cucumbers,
- Puccinia species in cereals,
- Pyricularia oryzae in rice,
- Rhizoctonia species in cotton, rice and lawns,
- Septoria tritici and Stagonospora nodorum in wheat,
- Uncinula necator in grapevines,
- Ustilago species in cereals and sugar cane, and
- Venturia species (scab) in apples and pears.

The compounds I are also suitable for controlling harmful fungi such as *Paecilomyces variotii* in the protection of materials (for example wood, paper, paint dispersions, fibers or tissues) and in the protection of stored products.

The compounds I are employed by treating the fungi or the plants, seeds, materials or the soil to be protected against fungal attack with a fungicidally effective amount of the active

compounds. The application can be carried out before or after the infection of the materials, plants or seeds by the fungi.

The fungicidal compositions generally comprise from 0.1 to 95, preferably from 0.5 to 90% by weight of active compound.

For use in crop protection, the application rates are, depending on the kind of effect desired, from 0.01 to 2.0 kg of active compound per ha.

The treatment of seeds generally requires active compound rates of from 0.001 to 0.1 g, preferably from 0.01 to 0.05 g, per kilogram of seed.

For use in the protection of materials or stored products, the active compound application rate depends on the kind of application area and effect desired. Customary application rates in the protection of materials are, for example, from 0.001 g to 2 kg, preferably from 0.005 g to 1 kg, of active compound per cubic meter of treated material.

The compounds I can be converted into the customary formulations, e.g. solutions, emulsions, suspensions, dusts, powders, pastes and granules. The use form depends on the specific intended use; in any case, it should ensure fine and uniform distribution of the compound according to the invention.

The formulations are prepared in a known manner, e.g. by extending the active compound with solvents and/or carriers, if desired using emulsifiers and dispersants. Solvents/auxiliaries which are suitable are essentially:

- water, aromatic solvents (for example Solvesso products, xylene), paraffins (for example mineral oil fractions), alcohols (for example methanol, butanol, pentanol, benzyl alcohol), ketones (for example cyclohexanone, gamma-butyrolactone), pyrrolidones (NMP, NOP), acetates (glycol diacetate), glycols, fatty acid dimethylamides, fatty acids and fatty acid esters. In principle solvent mixtures may also be used,

- carriers such as ground natural minerals (e.g. kaolins, clays, talc, chalk) and ground synthetic minerals (e.g. finely divided silica, silicates); emulsifiers such as nonionic and anionic emulsifiers (e.g. polyoxyethylene fatty alcohol ethers, alkylsulfonates and

arylsulfonates), and dispersants such as lignosulfite waste liquors and methylcellulose.

Suitable surfactants which can be used are the alkali metal, alkaline earth metal and ammonium salts of lignosulfonic acid, naphthalenesulfonic acid, phenolsulfonic acid, and dibutylnaphthalenesulfonic acid, alkylarylsulfonates, alkyl sulfates, alkylsulfonates, fatty alcohol sulfates, fatty acids and sulfated fatty alcohol glycol ethers, furthermore condensation products of sulfonated naphthalene and naphthalene derivatives with formaldehyde, condensation products of naphthalene or of naphthalene sulfonic acid with phenol and formaldehyde, polyoxyethylene octylphenol ethers, ethoxylated isooctylphenol, octylphenol and nonylphenol, alkylphenol polyglycol ethers, tributylphenyl polyglycol ethers, tristerylphenyl polyglycol ethers, alkylaryl polyether alcohols, alcohol and fatty alcohol ethylene oxide condensates, ethoxylated castor oil, polyoxyethylene alkyl ethers, ethoxylated polyoxypropylene, lauryl alcohol polyglycol ether acetal, sorbitol esters, lignosulfite waste liquors and methylcellulose are suitable.

Suitable for preparing directly sprayable solutions, emulsions, pastes or oil dispersions are mineral oil fractions having medium to high boiling points, such as kerosene or diesel fuel, furthermore coal-tar oils and oils of plant or animal origin, aliphatic, cyclic and aromatic hydrocarbons, for example, toluene, xylene, paraffin, tetrahydronaphthalene, alkylated naphthalenes or derivatives thereof, methanol, ethanol, propanol, butanol, cyclohexanol, cyclohexanone, isophorone, strongly polar solvents, for example dimethyl sulfoxide, N-methylpyrrolidone, or water.

Powders, compositions for broadcasting and dusts can be prepared by mixing or joint grinding of the active substances with a solid carrier.

Granules, for example coated granules, impregnated granules and homogenous granules, can be prepared by binding the active compounds to solid carriers. Solid carriers are, for example, mineral earths, such as silica gels, silicates, talc, kaolin, attaclay, limestone, lime, chalk, bole, loess, clay, dolomite, diatomaceous earth, calcium sulfate, magnesium sulfate, magnesium oxide, ground synthetic materials, fertilizers, such as ammonium sulfate, ammonium phosphate, ammonium nitrate, ureas and products

of plant origin, such as cereal meal, tree bark meal, wood meal and nutshell meal, cellulose powders and other solid carriers.

The formulations generally comprise from 0.01 to 95% by weight, preferably from 0.1 to 90% by weight, of the active compound. The active compounds are employed in a purity of from 90% to 100%, preferably from 95% to 100% (according to the NMR spectrum).

Examples of formulations are: 1. Products for dilution with water

A) Water-soluble concentrates (SL)
10 parts by weight of a compound according to the invention are dissolved in water or in a water-soluble solvent. As an alternative, wetters or other auxiliaries are added. The active compound dissolves upon dilution with water.

B) Dispersible concentrates (DC)
20 parts by weight of a compound according to the invention are dissolved in cyclohexanone with addition of a dispersant, for example polyvinylpyrrolidone. Dilution with water gives a dispersion.

C) Emulsifiable concentrates (EC)
15 parts by weight of a compound according to the invention are dissolved in xylene with addition of calcium dodecylbenzenesulfonate and castor oil ethoxylate (in each case 5%). Dilution with water gives an emulsion.

D) Emulsions (EW, EO)
40 parts by weight of a compound according to the invention are dissolved in xylene with addition of calcium dodecylbenzenesulfonate and castor oil ethoxylate (in each case 5%). This mixture is introduced into water by means of an emulsifying machine (Ultraturrax) and made into a homogeneous emulsion. Dilution with water gives an emulsion.

E) Suspensions (SC, OD)
In an agitated ball mill, 20 parts by weight of a compound according to the invention are comminuted with addition of dispersants, wetters and water or an organic solvent to give a fine active compound suspension. Dilution with water gives a stable suspension of the active compound.

F) Water-dispersible granules and water-soluble granules (WG, SG)

50 parts by weight of a compound according to the invention are ground finely with addition of dispersants and wetters and made into water-dispersible or water-soluble granules by means of technical appliances (for example extrusion, spray tower, fluidized bed). Dilution with water gives a stable dispersion or solution of the active compound.

G) Water-dispersible powders and water-soluble powders (WP, SP)
75 parts by weight of a compound according to the invention are ground in a rotor-stator mill with addition of dispersants, wetters and silica gel. Dilution with water gives a stable dispersion or solution of the active compound.

2. Products to be applied undiluted

H) Dustable powders (DP)
5 parts by weight of a compound according to the invention are ground finely and mixed intimately with 95% of finely divided kaolin. This gives a dustable product.

I) Granules (GR, FG, GG, MG)
0.5 part by weight of a compound according to the invention is ground finely and associated with 95.5% carriers. Current methods are extrusion, spray-drying or the fluidized bed. This gives granules to be applied undiluted.

J) ULV solutions (UL)
10 parts by weight of a compound according to the invention are dissolved in an organic solvent, for example xylene. This gives a product to be applied undiluted.

The active compounds can be applied as such, in the form of their formulations or in the application forms prepared therefrom, for example in the form of directly sprayable solutions, powders, suspensions or dispersions, emulsions, oil dispersions, pastes, dusts, compositions for broadcasting, or granules, by spraying, atomizing, dusting, broadcasting or watering. The application forms depend entirely on the intended uses; in any case, they should ensure very fine dispersion of the active compounds according to the invention.

Aqueous use forms can be prepared from emulsion concentrates, pastes or wettable powders (spray powders, oil dispersions) by addition of water. To prepare emulsions, pastes or oil dispersions, the substances can be homogenized in water as such or dissolved in an oil or solvent, by means of wetting agents,

tackifiers, dispersants or emulsifiers. However, concentrates comprising active compound, wetting agent, tackifier, dispersant or emulsifier and possibly solvent or oil which are suitable for dilution with water can also be prepared.

The active compound concentrations in the ready-to-use preparations can be varied over a relatively wide range. In general, they are from 0.0001 to 10%, preferably from 0.01 to 1%.

It is also possible to use the active compounds with a high degree of success in the ultra-low-volume method (ULV), it being possible to apply formulations comprising more than 95% by weight of active compound or even the active compound without additives.

Oils of various types, wetting agents, adjuvants, herbicides, fungicides, other pesticides and bactericides can be added to the active compounds, if desired even immediately prior to application (tank mix). These agents can be added to the compositions according to the invention in a weight ratio of 1:10 to 10:1.

The compositions according to the invention in the use form as fungicides may also be present in combination with other active compounds, for example with herbicides, insecticides, growth regulators, fungicides or else with fertilizers. In many cases, mixing of the compounds I, or of the compositions comprising them, in the use form as fungicides with other fungicides results in a broader fungicidal spectrum of activity.

The following list of fungicides, in combination with which the compounds according to the invention can be used, is intended to illustrate the possible combinations, but not to impose any limitation:

- acylalanines, such as benalaxyl, metalaxyl, ofurace or oxadixyl,
- amine derivatives, such as aldimorph, dodine, dodemorph, fenpropimorph, fenpropidin, guazatine, iminoctadine, spiroxamine or tridemorph,
- anilinopyrimidines, such as pyrimethanil, mepanipyrim or cyprodinyl,
- antibiotics, such as cycloheximide, griseofulvin, kasugamycin, natamycin, polyoxin or streptomycin,
- azoles, such as bitertanol, bromoconazole, cyproconazole, difenoconazole, dinitroconazole, epoxiconazole, fenbuconazole, fluquinconazole, flusilazole, hexaconazole,

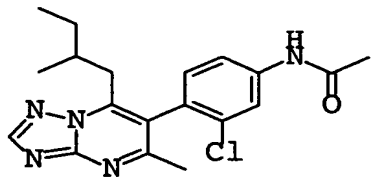
imazalil, metconazole, myclobutanil, penconazole, propiconazole, prochloraz, prothioconazole, tebuconazole, triadimefon, triadimenol, triflumizole or triticonazole,

- dicarboximides, such as iprodione, myclozolin, procymidone or vinclozolin,
- dithiocarbamates, such as ferbam, nabam, maneb, mancozeb, metam, metiram, propineb, polycarbamate, thiram, ziram or zineb,
- heterocyclic compounds, such as anilazine, benomyl, boscalid, carbendazim, carboxin, oxycarboxin, cyazofamid, dazomet, dithianon, famoxadone, fenamidone, fenarimol, fuberidazole, flutolanil, furametpyr, isoprothiolane, mepronil, nuarimol, probenazole, proquinazid, pyrifenox, pyroquilon, quinoxyfen, silthiofam, thiabendazole, thifluzamide, thiophanate-methyl, tiadinil, tricyclazole or triforine,
- copper fungicides, such as Bordeaux mixture, copper acetate, copper oxychloride or basic copper sulfate,
- nitrophenyl derivatives, such as binapacryl, dinocap, dinobuton or nitrophthal-isopropyl
- phenylpyrroles, such as fenpiclonil or fludioxonil,
- sulfur
- other fungicides, such as acibenzolar-S-methyl, benthiavalicarb, carpropamid, chlorothalonil, cyflufenamid, cymoxanil, dazomet, diclomezine, diclocymet, diethofencarb, edifenphos, ethaboxam, fenhexamid, fentin acetate, fenoxanil, ferimzone, fluazinam, fosetyl, fosetyl-aluminum, iprovalicarb, hexachlorobenzene, metrafenone, pencycuron, propamocarb, phthalide, tolclofos-methyl, quintozene or zoxamide
- strobilurins, such as azoxystrobin, dimoxystrobin, fluoxastrobin, kresoxim-methyl, metominostrobin, orysastrobin, picoxystrobin, pyraclostrobin or trifloxystrobin,
- sulfenic acid derivatives, such as captafol, captan, dichlofluanid, folpet or tolylfluanid
- cinnamides and analogous compounds, such as dimethomorph, flumetover or flumorph.

Synthesis examples

The procedures described in the synthesis examples below were used to prepare further compounds I by appropriate modification of the starting compounds. The compounds thus obtained are listed in the tables below, together with physical data.

Example 1. Preparation of 5-methyl-6-(2-chloro-4-acetylamino-phenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (I-16)



1.1. 5-Methyl-6-(2-chloro-4-amino-phenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine

A mixture of 3 g (8.3 mmol) of 5-methyl-6-(2-chloro-4-nitro-phenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (preparation analogously to WO 03/004465), 100 ml of acetic acid, 1 ml of conc. sulfuric acid and 0.5 g of 10% palladium-on-carbon was stirred under an atmosphere of hydrogen overnight.

The reaction mixture was then filtered off with suction through kieselguhr, the ethyl acetate phase was diluted with water and the aqueous phase was extracted three times with methylene chloride. The combined organic phases were washed with $NaHCO_3$ solution and water until neutral and concentrated. The residue was purified by column chromatography using cyclohexane/ethyl acetate mixture.

This gave 2.1 g (80%) of the title compound 1.1. as a colorless solid.

^{1}H-NMR ($CDCl_3$, δ in ppm): 8.45 (s, 1H); 7.0 (d, broad, 1H); 6.9 (s, broad, 1H); 6.7 (d, broad, 1H); 3.6 – 4.1 (s, very broad, 2 H); 3.1 (dd, 0.5 H); 2.95 (dd, 0.5 H); 2.85 (dd, 0.5 H); 2.7 (dd, 0.5 H); 2.4 (s, 3H), 2.1 (m, 1H); 1.0 – 1.4 (m, 2H); 0.7 – 0.85 (m, 6H)

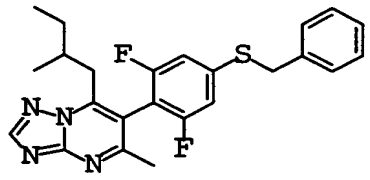
1.2. 5-Methyl-6-(2-chloro-4-acetylamino-phenyl)-7-(2-methyl-butyl)-1,2,4-triazolo[1,5a]pyrimidine

0.25 g (3 mmol) of pyridine and 0.2 g (2.5 mmol) of acetyl chloride were added to a mixture of 0.5 g (1.5 mmol) of 5-methyl-6-(2-chloro-4-amino-phenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (example 1.1.) and 10 ml of methylene chloride, and the mixture was stirred at room temperature for about 1 hour.

The reaction mixture was then washed with dilute hydrochloric acid and water and concentrated. The residue obtained was 0.5 g (88%) of the title compound 1.2.

^{1}H-NMR ($CDCl_3$, δ in ppm): 8.45 (s, 1H); 8.15 (s, broad, 1H); 7.95 (s, broad, 1H); 7.65 (m, 1H); 7.2 (m, 1H); 3.1 (dd, 0.5 H); 2.95 (dd, 0.5 H); 2.85 (dd, 0.5 H); 2.65 (dd, 0.5 H); 2.4 (s, 3H); 2.3 (s, 3H); 2.1 (m, 1H); 1.0 – 1.35 (m, 1H); 0.7 – 0.85 (m, 6H)

Example 2: 5-Methyl-6-(2,6-difluoro-4-benzylthiophenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (I-3)

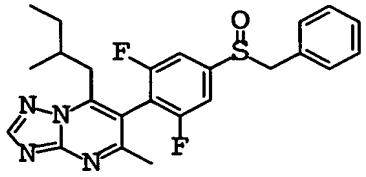


Under an atmosphere of nitrogen, 0.3 g (12.5 mmol) of sodium hydride were added to 1.3 g (10 mmol) of benzyl mercaptan in 50 ml of N-methylpyrrolidone, and the mixture was stirred at room temperature until the evolution of hydrogen had ceased (about 15 min).

3.3 g (10 mmol) of 5-methyl-6-(2,4,6-trifluorophenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (preparation analogously to WO 03/004465) were then added, and the mixture was stirred at room temperature for about 2 hours. The reaction mixture was then diluted with water, and the aqueous phase was extracted three times with methyl t-butyl ether. The combined organic phases were washed twice with water and concentrated. The residue obtained was purified by MPLC on silica gel RP-18 using acetonitrile/water mixtures. This gave 2.1 g (50%) of the title compound 2 as a light-yellow, viscous material.

^{1}H-NMR ($CDCl_3$, δ in ppm): 8.45 (s, 1H); 7.4 (m, 5H); 6.95 (d, 2H); 4.25 (s, 2H); 3.0 (dd, 1H); 2.75 (dd, 1H); 2.45 (s, 3H); 2.05 (m, 1H); 1.25 (m, 1H); 1.1 (m, 1H); 0.8 (t, 3H); 0.7 (d, 3H)

Example 3: 5-Methyl-6-(2,6-difluoro-4-benzylsulfoxyl-phenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (I-5)



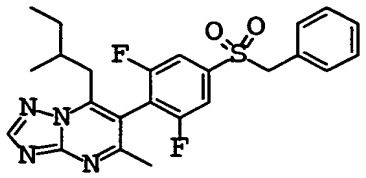
0.5 g (2.2 mmol) of 77% strength m-chloroperbenzoic acid was added to 0.9 g (2 mmol) of 5-methyl-6-(2,6-difluoro-4-benzyl-thiophenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine

(Example 2) in 30 ml of methylene chloride, and the mixture was stirred at room temperature for about 2 hours.

Dilute aqueous sodium hydroxide solution was then added to the reaction mixture, the phases were separated and the organic phase was extracted twice with water. The organic phase was concentrated and the residue was purified by MPLC on silica gel RP-18 using acetonitrile/water mixtures. This gave 0.7 g (77%) of the title compound 3 as a light-yellow oil.

^{1}H-NMR ($CDCl_3$, δ in ppm): 8.5 (s, 1H); 7.35 (m, 3H); 7.1 (m, 4H); 4.2 (dd, 2H); 3.05 (dd, 1H); 2.7 (dd, 1H); 2.45 (s, 3H); 2.1 (m, 1H); 1.3 (m, 1H); 1.1 (m, 1H); 0.8 (t, 3H); 0.75 (d, broad, 3H)

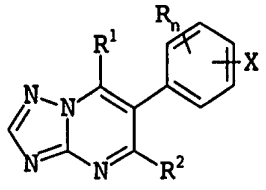
Example 4: 5-Methyl-6-(2,6-difluoro-4-benzylsulfonyl-phenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (I-6)



0.3 g (1.3 mmol) of 77% strength m-chloroperbenzoic acid was added to 0.4 g (1 mmol) of 5-methyl-6-(2,6-difluoro-4-benzylsulfoxylphenyl)-7-(2-methylbutyl)-1,2,4-triazolo[1,5a]pyrimidine (example 3) in 10 ml of methylene chloride, and the mixture was stirred at room temperature for about 1 hour.

The reaction mixture was then extracted with dilute aqueous sodium hydroxide solution and concentrated, and the residue was purified by column chromatography using cyclohexane/ethyl acetate mixtures. This gave 0.25 g (53%) of the title compound 4 as a light-yellow oil.

^{1}H-NMR ($CDCl_3$, δ in ppm): 8.5 (s, 1H); 7.35 (m, 5H); 7.2 (d, 2H); 4.45 (s, 2H); 3.0 (dd, 1H); 2.7 (dd, 1H); 2.4 (s, 3H); 2.1 (m, 1H); 1.3 (m, 1H); 1.1 (m, 1H); 0.8 (t, 3H); 0.7 (d, 3H)



I

Table of active compounds

No.	R^1	R^2	R_n	X	Physical data (m.p. [°C], IR [cm^{-1}], ^{1}H-NMR [ppm])
I-1	but-3-enyl	methyl	2,6-F_2	4-S-t-C_4H_9	100-102
I-2	but-3-enyl	methyl	2,6-F_2	4-SO_2-t-C_4H_9	176-178
I-3	2-methylbutyl	methyl	2,6-F_2	4-S-benzyl	8.45 (s, 1H); 4.25 (s, 2H); 2.45 (s, 3H)
I-4	2-methylbutyl	methyl	2,6-F_2	4-S-t-C_4H_9	95-97
I-5	2-methylbutyl	methyl	2,6-F_2	4-SO-benzyl	8.5 (s, 1H); 4.2 (dd, 2H); 2.45 (s, 3H)
I-6	2-methylbutyl	methyl	2,6-F_2	4-SO_2-benzyl	8.5 (s, 1H); 4.45 (s, 2H); 2.4 (s, 3H)
I-7	2-methylbutyl	methyl	2,6-F_2	4-S-CH_3	8.45 (s, 1H); 2.6 (s, 3H); 2.45 (s, 3H)
I-8	2-methylbutyl	methyl	2,6-F_2	4-SO-CH_3	8.5 (s, 1H); 2.85 (s, 3H); 2.45 (s, 3H)
I-9	2-methylbutyl	methyl	2,6-F_2	4-SO_2-CH_3	8.5 (s, 1H); 3.25 (s, 3H); 2.5 (s, 3H)
I-10	2-methylbutyl	methyl	2,6-F_2	4-SO_2-n-C_3H_7	8.45 (s, 1H); 3.2 (t, 2H); 2.45 (s, 3H)
I-11	2-methylbutyl	methyl	2,6-F_2	4-S-C_2H_5	8.45 (s, 1H); 3.1 (q, 2H); 2.45 (s, 3H)
I-12	2-methylbutyl	methyl	2,6-F_2	4-S-n-C_3H_7	8.45 (s, 1H); 3.0 (t, 2H); 2.45 (s, 3H)
I-13	2-methylbutyl	methyl	2,6-F_2	4-SO-C_2H_5	8.45 (s, 1H); 7.4 (m, 2H); 2.45 (s, 3H)
I-14	2-methylbutyl	methyl	2,6-F_2	4-SO_2-C_2H_5	122-124
I-15	2-methylbutyl	methyl	2,6-F_2	4-SO-n-C_3H_7	8.5 (s, 1H); 2.9 (t, 2H); 2.45 (s, 3H)
I-16	2-methylbutyl	methyl	2-Cl	4-NH-CO-CH_3	8.45 (s, 1H); 2.4 (s, 3H); 2.3 (s, 3H)

Examples of the activity against harmful fungi

The fungicidal activity of the compounds of the formula I was demonstrated by the following experiments:

The active compounds were formulated separately as a stock solution comprising 0.25% by weight of active compound in acetone or DMSO. 1% by weight of the emulsifier Uniperol® EL (wetting agent having emulsifying and dispersing action based on ethoxylated alkylphenols) was added to this solution. The stock solutions of the active compounds were diluted with water to the stated concentration.

Use examples

Example 1: Activity against mildew on cucumber leaves caused by *Sphaerotheca fuliginea*, protective application

Leaves of cucumber seedlings of the cultivar "Chinese Snake" which had been grown in pots were, at the cotyledon stage, sprayed to runoff point with an aqueous suspension in the active compound concentration indicated below. 20 hours after the spray coating had dried on, the plants were inoculated with an aqueous spore suspension of mildew of cucumbers (*Sphaerotheca fuliginea*). The plants were then cultivated in a greenhouse at 20-24°C and 60-80% relative atmospheric humidity for 7 days. The extent of the mildew development was then determined visually in % infection of the cotyledon area.

In this test, the plants which had been treated with 250 ppm of the compounds I-7 and I-8 showed an infection of ≤ 20%, whereas the untreated control plants were 90% mildew infected.

Example 2: Activity against early blight of tomato caused by *Alternaria solani*

Leaves of potted plants of the cultivar "Golden Princess" were sprayed to runoff point with an aqueous suspension having the concentration of active compound stated below. The next day, the leaves were infected with an aqueous spore suspension of *Alternaria solani* in a 2% biomalt solution having a density of 0.17×10^6 spores/ml. The plants were then placed in a water-vapor-saturated chamber at temperatures between 20 and 22°C. After 5 days, the blight on the untreated, but infected control

plants had developed to such an extent that the infection could be determined visually in %.

In this test, the plants which had been treated with 250 ppm of the compounds I-4, I-7, I-12 and I-13 showed an infection of ≤ 30%, whereas the untreated (control) plants were 90% damaged by the fungal infection.

Example 3: Activity against peronospora of grape vines caused by *Plasmopara viticola*

Leaves of potted vines were sprayed to runoff point with an aqueous suspension having the concentration of active compound stated below. The next day, the undersides of the leaves were inoculated with an aqueous sporangial suspension of *Plasmopara viticola*. The vines were initially placed in a water-vapor-saturated chamber at 24°C for 48 hours and then in a greenhouse at temperatures between 20 and 30°C for 5 days. After this period of time, the plants were again placed in a humid chamber for 16 hours to promote sporangiophore eruption. The extent of the development of the infection on the undersides of the leaves was then determined visually.

In this test, the plants which had been treated with 250 ppm of the compounds I-4 to I-7 showed an infection of ≤ 30%, whereas the untreated (control) plants were 80% infected by harmful fungi.